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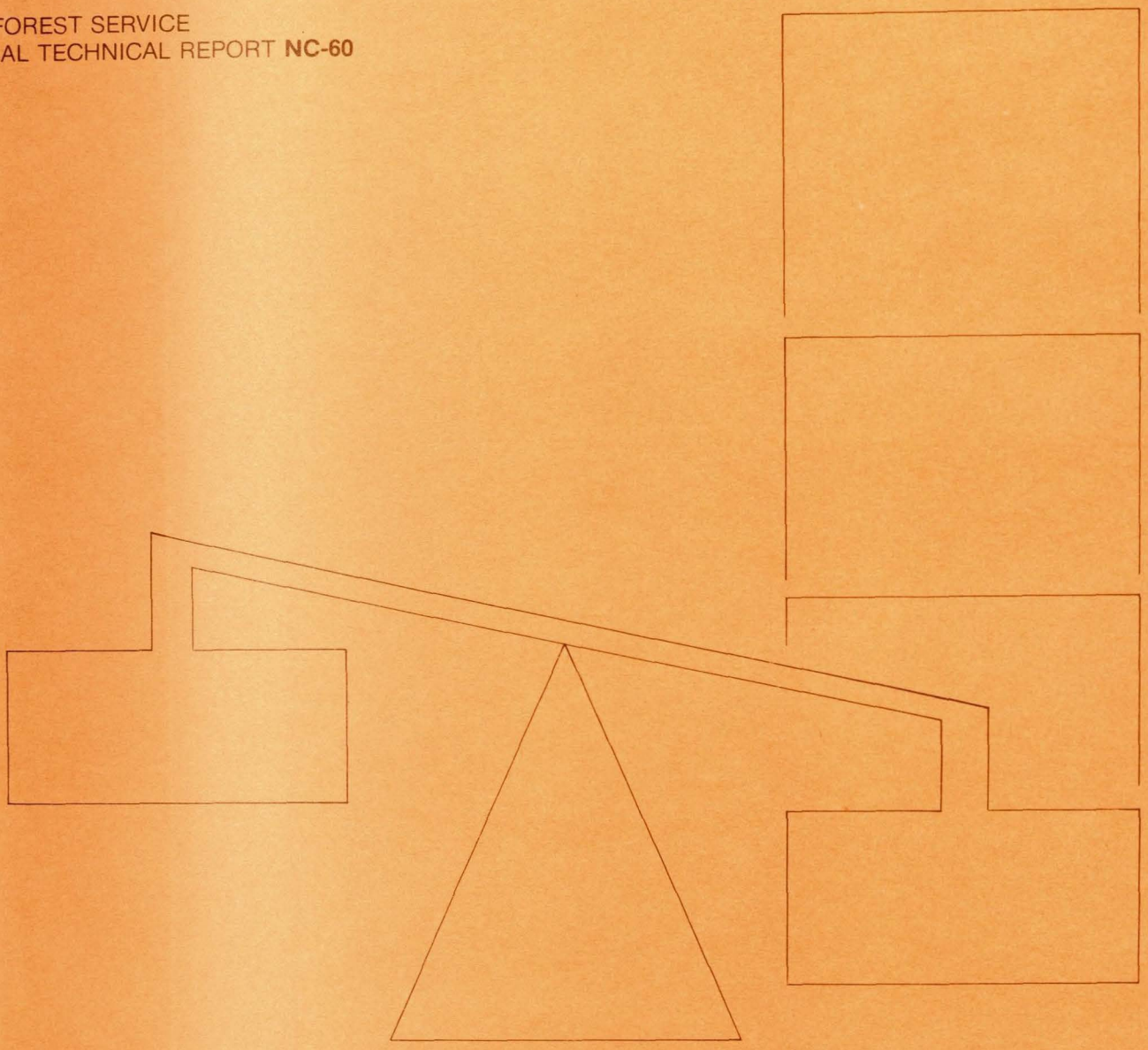

Weight and volume equations and tables for **six upland hardwoods in southern Illinois**

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Corrections for General Technical Report NC-60:

At the top of tables 15 and 16 (pages 15 and 16)

change (In kilograms) to (In cubic meters)

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WEIGHT AND VOLUME EQUATIONS AND TABLES FOR SIX UPLAND HARDWOODS IN SOUTHERN ILLINOIS

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As the demand for lumber and wood products continues to increase, the need to achieve more complete and efficient utilization of our available timber resource becomes more urgent. In order to do so, we need to know the volume and weight of the entire tree and of its component parts. The tables presented in this report give the volumes and weights for six upland hardwood species— red oak (*Quercus rubra* L.), black oak (*Q. velutina* Lam.), white oak (*Q. alba* L.), hickory (Carya sp.), white ash (*Fraxinus americana* L.), and yellow-poplar (*Liriodendron tulipifera* L.).

For each species, 40 trees were felled and measured. The trees were all harvested from within three 8-hectare areas on the Shawnee National Forest in southern Illinois. The aspect was predominantly southern, and the trees were located on slope positions ranging from ridgetop to valley bottom. The major soil types were Typic Hapludalfs, Ultic Hapludalfs, and Aeric Fluvaquants. The sample was stratified into three size classes (table 1).

After each tree was felled, the main stem was sectioned into approximately 2.5-m long segments up to a 10-cm top diameter inside bark (dib). The dib's were measured at the ends of the segments, and their volumes were calculated using Smalian's formula. Four 3- to 5-cm thick disks were removed from along the main stem, sealed in plastic bags, and returned to the laboratory for determining specific gravity, green weight:dry weight ratio, and bark:wood ratio.

Table 1.— *Sample characteristics*

Item	Red oak	Black oak	White oak	Hickory	White ash	Yellow-poplar
			No. of trees			
13-28 cm dbh	15	14	14	18	16	13
28-45 cm dbh	14	13	13	19	18	21
46+ cm dbh	11	13	13	3	6	6
			cm			
min. dbh	13.2	12.7	14.2	12.7	13.5	15.2
max. dbh	58.9	54.9	59.9	58.7	58.9	57.2
			m			
min. height	12.4	13.7	11.4	12.0	13.9	15.6
max. height	29.4	28.9	28.2	29.3	29.9	29.0

The rest of the stem and the branches were segregated into three classes— material greater than 10-cm dib, that between 5 cm and 10 cm, and that (including foliage) less than 5 cm. This material was weighed in the field on a platform scale. Three disks each were taken from the 5- to 10-cm and less than 5-cm material for laboratory analysis as above.

In the laboratory, a wedge-shaped sample was cut from each disk and weighed immediately to determine the green weight with bark. The bark was then removed, the green weight without bark was measured, and the green volume of the wood determined by means of a xylometer. Both wood and bark

were then ovendried at 70C for 72 hours, the dry weight of the wood and bark and of the wood alone were measured, and the dry volume of the wood determined.

Data from one species, black oak, were used to select the form of the regression equations employed to develop the tables. Initial screening of possible equations narrowed the choice to the following five:

$$W = aD^b \quad (1)$$
$$\log W = a + b \log D \quad (2)$$
$$W = a + bD^2H \quad (3)$$
$$\log W = a + b \log D^2H \quad (4)$$
$$W = aD^bH^c \quad (5)$$

where W = either the green weight of the total tree or the green volume to a 10 cm top,

D = diameter breast height,
H = total tree height, and
a,b,c = regression coefficients.

The black oak data were divided into two 20-tree stratified random subsets, one subset was used to develop the equations and the second subset was used to test them. Based on the tests (equation 5) a robust nonlinear equation involving both dbh and total height, was selected. Regression equations were then developed to predict weight or volume for the following seven components for each species:

1. Total tree green weight above stump height (approximately 30 cm) including bark and leaves.
2. Green weight above stump height greater than 5 cm (2 in) in diameter including bark.
3. Green weight above stump height greater than 10 cm (4 in) in diameter including bark.
4. Ovendry weight above stump height greater than 5 cm (2 in) in diameter excluding bark.
5. Ovendry weight above stump height greater than 10 cm (4 in) in diameter excluding bark.
6. Green volume above stump height greater than 5 cm (2 in) excluding bark.
7. Green volume above stump height greater than 10 cm (4 in) excluding bark.

Both English and metric unit tables (3-16) are given for each of the above. The range of the data from which the equations were derived is outlined on the total green weight table for each species.

The final equations (table 17) derived from this study are reasonably accurate for the area in which the tree data were collected (table 2). The equations will predict weight or volume within an average of 9 percent for the individual study trees from which they were derived. The composite error for a stand of trees would generally be expected to be smaller than the average error for a tree.

Table 2.— *Summary of equation accuracy* (In percent error)[1]

Item	Black oak	White oak	Red oak	Hickory	White ash	Yellow-poplar
GWBT	6.8	11.3	9.2	13.2	9.5	7.2
GWB2	7.4	11.5	7.6	13.1	11.0	7.7
GWB4	7.9	10.4	7.8	13.3	7.8	6.0
ODW2	7.3	11.2	7.2	12.9	8.3	6.9
ODW4	7.9	10.2	7.7	13.1	7.7	6.1
VOL2	7.0	11.8	7.4	12.9	8.1	6.8
VOL4	7.7	10.2	7.5	13.1	7.6	6.2
AVG	7.4	10.9	7.8	13.1	8.6	6.7

[1] Σ(measured-predicted)/mean measured = percent error.

The extent to which the equations can be generalized to other areas is not known, although the table values compare reasonably well with previously published values. As with other types of yield tables, preliminary testing is advisable before using them in other areas or sites.

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Raisanen, Donald L. 1977. Total-tree volume and weight equations and tables for white ash, *Fraxinus americana* L., and yellow-poplar, *Liriodendron tulipifera* L., in southern Illinois. M.S. thesis. Southern Illinois University, Carbondale, Illinois.

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Table 3.— *Total tree green weight*
(In pounds)

BLACK OAK

D.b.h. class (in)	Total tree height (feet)							
	40	48	56	64	72	80	88	96
6	273	322	370	417	464	511	556	602
8	510	601	690	779	866	953	1,038	1,123
10	827	975	1,120	1,263	1,405	1,545	1,684	1,822
12	1,227	1,447	1,663	1,876	2,086	2,295	2,501	2,705
14	1,714	2,021	2,323	2,620	2,914	3,205	3,493	3,778
16	2,290	2,700	3,103	3,500	3,893	4,281	4,666	5,047
18	2,956	3,485	4,005	4,518	5,025	5,526	6,023	6,515
20	3,715	4,379	5,033	5,678	6,315	6,945	7,568	8,187
22	4,567	5,384	6,188	6,981	7,764	8,538	9,306	10,066
24	5,516	6,502	7,473	8,430	9,376	10,311	11,237	12,155
26	6,561	7,734	8,889	10,027	11,152	12,265	13,367	14,459

RED OAK

6	208	254	301	349	397	446	496	546
8	404	494	585	678	772	867	963	1,060
10	676	827	980	1,135	1,293	1,452	1,613	1,775
12	1,031	1,260	1,493	1,730	1,970	2,212	2,457	2,704
14	1,471	1,798	2,131	2,469	2,812	3,158	3,507	3,860
16	2,002	2,448	2,901	3,361	3,827	4,298	4,774	5,254
18	2,628	3,213	3,808	4,411	5,023	5,641	6,266	6,897
20	3,352	4,098	4,857	5,626	6,406	7,195	7,992	8,796
22	4,177	5,106	6,052	7,011	7,983	8,966	9,959	10,961
24	5,106	6,243	7,399	8,571	9,759	10,961	12,175	13,400
26	6,143	7,510	8,900	10,311	11,741	13,186	14,646	16,120

WHITE OAK

6	348	380	409	437	462	486	509	531
8	660	720	776	827	876	921	964	1,006
10	1,083	1,182	1,274	1,358	1,438	1,512	1,583	1,651
12	1,624	1,773	1,910	2,037	2,155	2,268	2,374	2,476
14	2,287	2,497	2,690	2,868	3,036	3,194	3,344	3,487
16	3,077	3,360	3,619	3,859	4,084	4,297	4,499	4,692
18	3,998	4,365	4,701	5,013	5,306	5,583	5,845	6,095
20	5,052	5,516	5,941	6,336	6,706	7,055	7,386	7,703
22	6,243	6,817	7,342	7,830	8,287	8,719	9,129	9,519
24	7,575	8,271	8,908	9,500	10,055	10,578	11,075	11,550
26	9,049	9,880	10,642	11,349	12,012	12,637	13,231	13,798

HICKORY

6	432	500	566	630	692	753	812	871
8	737	852	964	1,073	1,179	1,283	1,384	1,484
10	1,114	1,289	1,458	1,622	1,783	1,940	2,093	2,244
12	1,562	1,807	2,044	2,275	2,499	2,719	2,935	3,146
14	2,078	2,404	2,720	3,027	3,326	3,618	3,905	4,187
16	2,662	3,080	3,484	3,877	4,260	4,634	5,002	5,362
18	3,311	3,831	4,334	4,822	5,299	5,765	6,222	6,670
20	4,025	4,657	5,268	5,862	6,441	7,008	7,563	8,108
22	4,802	5,556	6,286	6,994	7,686	8,362	9,024	9,675
24	5,642	6,529	7,386	8,218	9,030	9,825	10,603	11,368
26	6,545	7,572	8,566	9,532	10,474	11,396	12,299	13,185

WHITE ASH

6	278	305	330	353	375	395	415	433
8	530	582	629	673	714	753	790	826
10	875	959	1,037	1,109	1,177	1,242	1,303	1,362
12	1,316	1,443	1,560	1,669	1,772	1,869	1,961	2,049
14	1,860	2,039	2,205	2,359	2,503	2,640	2,771	2,895
16	2,509	2,751	2,974	3,182	3,377	3,562	3,738	3,906
18	3,267	3,582	3,873	4,143	4,398	4,638	4,867	5,086
20	4,137	4,537	4,905	5,247	5,569	5,874	6,164	6,441
22	5,123	5,618	6,073	6,497	6,896	7,274	7,633	7,976
24	6,226	6,828	7,381	7,897	8,382	8,840	9,277	9,694
26	7,450	8,170	8,832	9,449	10,029	10,578	11,100	11,600

YELLOW POPLAR

6	233	289	347	406	467	529	593	657
8	391	486	583	684	786	891	997	1,106
10	586	728	874	1,024	1,177	1,334	1,494	1,656
12	815	1,012	1,215	1,424	1,637	1,855	2,078	2,303
14	1,078	1,338	1,606	1,882	2,164	2,452	2,746	3,045
16	1,372	1,704	2,045	2,397	2,756	3,123	3,497	3,877
18	1,698	2,108	2,532	2,966	3,411	3,865	4,328	4,798
20	2,055	2,551	3,063	3,589	4,127	4,677	5,237	5,806
22	2,442	3,032	3,640	4,265	4,905	5,558	6,223	6,900
24	2,859	3,549	4,261	4,992	5,741	6,505	7,284	8,076
26	3,304	4,102	4,925	5,771	6,636	7,520	8,420	9,335

Table 4.— *Tree green weight to 2-inch top*
(In pounds)

D.b.h. class (in)	Total tree height (feet)							
	40	48	56	64	72	80	88	96
BLACK OAK								
6	210	252	293	335	377	419	461	503
8	399	479	559	638	718	798	878	957
10	658	789	920	1,052	1,183	1,315	1,446	1,578
12	989	1,187	1,384	1,582	1,779	1,977	2,175	2,372
14	1,396	1,675	1,954	2,233	2,512	2,791	3,070	3,349
16	1,882	2,259	2,635	3,011	3,387	3,763	4,139	4,516
18	2,450	2,940	3,429	3,919	4,409	4,898	5,388	5,877
20	3,101	3,721	4,341	4,961	5,581	6,200	6,820	7,440
22	3,838	4,606	5,373	6,140	6,907	7,674	8,441	9,208
24	4,664	5,596	6,528	7,460	8,392	9,324	10,256	11,188
26	5,578	6,693	7,808	8,923	10,038	11,153	12,267	13,382
RED OAK								
6	208	246	284	321	358	395	431	467
8	403	477	550	622	694	764	835	905
10	673	797	918	1,039	1,158	1,277	1,394	1,511
12	1,024	1,211	1,397	1,580	1,762	1,942	2,120	2,298
14	1,459	1,727	1,991	2,252	2,511	2,767	3,022	3,275
16	1,983	2,347	2,706	3,061	3,413	3,762	4,108	4,451
18	2,600	3,077	3,548	4,013	4,474	4,932	5,385	5,836
20	3,313	3,920	4,520	5,113	5,701	6,283	6,861	7,435
22	4,124	4,880	5,627	6,366	7,097	7,822	8,542	9,257
24	5,037	5,961	6,873	7,775	8,669	9,555	10,434	11,307
26	6,055	7,166	8,262	9,346	10,420	11,485	12,542	13,591
WHITE OAK								
6	296	297	298	298	299	299	300	300
8	604	606	608	609	610	611	612	613
10	1,051	1,054	1,057	1,060	1,062	1,064	1,066	1,067
12	1,652	1,657	1,662	1,666	1,669	1,672	1,675	1,678
14	2,422	2,430	2,436	2,442	2,447	2,452	2,456	2,459
16	3,374	3,384	3,394	3,401	3,408	3,415	3,420	3,426
18	4,519	4,533	4,546	4,556	4,566	4,574	4,582	4,588
20	5,869	5,888	5,904	5,918	5,930	5,941	5,951	5,960
22	7,435	7,459	7,479	7,497	7,512	7,526	7,538	7,550
24	9,227	9,257	9,282	9,303	9,322	9,339	9,355	9,369
26	11,255	11,291	11,321	11,347	11,371	11,392	11,411	11,428
HICKORY								
6	316	362	405	447	488	527	566	603
8	565	647	724	799	872	942	1,011	1,078
10	887	1,014	1,137	1,254	1,368	1,479	1,586	1,691
12	1,281	1,466	1,642	1,812	1,977	2,136	2,292	2,444
14	1,749	2,001	2,241	2,473	2,698	2,916	3,128	3,336
16	2,290	2,619	2,935	3,239	3,533	3,818	4,096	4,368
18	2,904	3,322	3,722	4,108	4,481	4,843	5,195	5,540
20	3,593	4,110	4,605	5,081	5,542	5,990	6,426	6,852
22	4,355	4,981	5,581	6,159	6,718	7,261	7,790	8,306
24	5,191	5,938	6,653	7,341	8,008	8,655	9,285	9,901
26	6,101	6,979	7,819	8,629	9,412	10,172	10,913	11,637
YELLOW POPLAR								
6	121	165	216	272	334	401	473	550
8	205	282	368	464	569	682	805	936
10	310	425	556	700	859	1,031	1,216	1,414
12	435	596	778	981	1,203	1,444	1,703	1,980
14	578	792	1,035	1,304	1,599	1,920	2,264	2,633
16	740	1,014	1,325	1,669	2,047	2,457	2,898	3,370
18	919	1,261	1,647	2,075	2,545	3,055	3,603	4,189
20	1,117	1,532	2,001	2,522	3,092	3,712	4,378	5,090
22	1,332	1,827	2,386	3,007	3,688	4,427	5,221	6,071
24	1,565	2,146	2,803	3,532	4,332	5,199	6,132	7,130
26	1,814	2,488	3,250	4,095	5,022	6,028	7,110	8,267
WHITE ASH								
6	154	201	252	306	363	423	486	552
8	268	349	437	531	631	735	845	959
10	411	536	671	815	968	1,129	1,297	1,472
12	583	761	952	1,157	1,374	1,602	1,841	2,090
14	784	1,023	1,280	1,556	1,847	2,154	2,475	2,810
16	1,013	1,322	1,655	2,010	2,387	2,783	3,198	3,631
18	1,270	1,657	2,075	2,521	2,993	3,490	4,010	4,553
20	1,555	2,029	2,540	3,086	3,664	4,273	4,910	5,574
22	1,868	2,436	3,050	3,706	4,400	5,131	5,896	6,693
24	2,207	2,879	3,605	4,380	5,200	6,064	6,968	7,911
26	2,574	3,358	4,204	5,108	6,064	7,072	8,126	9,225

Table 5.— *Tree green weight to 4-inch top*
(In pounds)

D.b.h. class (in)	Total tree height (feet)							
	40	48	56	64	72	80	88	96
BLACK OAK								
6	186	220	255	289	323	357	391	425
8	361	428	496	562	629	694	760	825
10	604	717	830	941	1,052	1,163	1,272	1,381
12	920	1,093	1,264	1,434	1,603	1,771	1,938	2,104
14	1,313	1,560	1,805	2,048	2,289	2,529	2,767	3,004
16	1,787	2,124	2,457	2,787	3,116	3,442	3,767	4,090
18	2,346	2,787	3,225	3,659	4,090	4,518	4,944	5,368
20	2,992	3,555	4,113	4,666	5,216	5,763	6,306	6,847
22	3,729	4,430	5,126	5,815	6,500	7,181	7,859	8,532
24	4,559	5,417	6,266	7,110	7,947	8,780	9,608	10,431
26	5,484	6,516	7,539	8,553	9,561	10,562	11,558	12,549
RED OAK								
6	185	217	248	278	308	337	366	394
8	366	428	489	549	608	665	722	779
10	620	726	829	931	1,030	1,128	1,225	1,320
12	955	1,118	1,277	1,432	1,586	1,736	1,885	2,032
14	1,375	1,609	1,838	2,063	2,283	2,500	2,715	2,926
16	1,886	2,207	2,521	2,829	3,131	3,429	3,723	4,013
18	2,492	2,917	3,331	3,738	4,138	4,531	4,919	5,303
20	3,198	3,742	4,274	4,796	5,309	5,814	6,312	6,804
22	4,006	4,688	5,355	6,009	6,651	7,284	7,908	8,524
24	4,922	5,760	6,579	7,382	8,171	8,949	9,716	10,473
26	5,948	6,961	7,951	8,921	9,875	10,814	11,741	12,656
WHITE OAK								
6	266	276	285	292	299	306	312	317
8	530	550	567	583	597	609	621	632
10	905	939	969	995	1,019	1,040	1,060	1,079
12	1,402	1,454	1,500	1,540	1,577	1,611	1,642	1,671
14	2,029	2,104	2,170	2,229	2,283	2,331	2,376	2,418
16	2,795	2,899	2,990	3,071	3,144	3,211	3,273	3,331
18	3,707	3,845	3,965	4,073	4,171	4,260	4,342	4,418
20	4,772	4,950	5,105	5,244	5,369	5,484	5,590	5,688
22	5,998	6,221	6,416	6,591	6,748	6,892	7,025	7,149
24	7,389	7,664	7,905	8,120	8,314	8,492	8,655	8,808
26	8,953	9,286	9,578	9,838	10,073	10,288	10,487	10,672
HICKORY								
6	265	302	338	373	406	439	471	501
8	484	553	618	682	743	802	860	917
10	772	882	987	1,089	1,186	1,281	1,374	1,464
12	1,132	1,293	1,447	1,596	1,739	1,878	2,014	2,146
14	1,564	1,787	2,000	2,205	2,403	2,595	2,782	2,965
16	2,070	2,364	2,646	2,917	3,179	3,434	3,681	3,923
18	2,650	3,027	3,388	3,735	4,070	4,396	4,713	5,022
20	3,305	3,776	4,226	4,659	5,077	5,483	5,879	6,264
22	4,036	4,611	5,161	5,689	6,201	6,697	7,179	7,650
24	4,844	5,534	6,194	6,829	7,442	8,037	8,617	9,182
26	5,730	6,546	7,326	8,077	8,802	9,507	10,192	10,861
YELLOW POPLAR								
6	111	158	213	276	347	425	511	604
8	183	260	350	453	569	697	838	992
10	268	382	514	665	835	1,024	1,231	1,456
12	367	522	704	911	1,143	1,402	1,685	1,993
14	479	681	918	1,188	1,491	1,828	2,197	2,600
16	603	857	1,155	1,495	1,877	2,300	2,766	3,272
18	738	1,050	1,414	1,831	2,299	2,818	3,388	4,008
20	885	1,259	1,696	2,195	2,756	3,378	4,062	4,805
22	1,043	1,484	1,998	2,587	3,248	3,981	4,786	5,662
24	1,212	1,724	2,322	3,005	3,773	4,625	5,560	6,578
26	1,391	1,978	2,665	3,449	4,331	5,308	6,382	7,550
WHITE ASH								
6	160	191	222	254	285	315	346	377
8	303	362	421	479	538	596	655	713
10	496	593	689	786	882	977	1,073	1,168
12	743	888	1,032	1,176	1,320	1,464	1,607	1,750
14	1,045	1,249	1,452	1,655	1,857	2,059	2,260	2,461
16	1,404	1,679	1,952	2,224	2,496	2,767	3,038	3,308
18	1,823	2,179	2,533	2,887	3,240	3,592	3,943	4,293
20	2,301	2,751	3,199	3,646	4,091	4,535	4,979	5,421
22	2,842	3,397	3,951	4,502	5,052	5,601	6,149	6,695
24	3,446	4,119	4,790	5,459	6,126	6,791	7,455	8,118
26	4,114	4,918	5,719	6,517	7,313	8,108	8,900	9,692

Table 6.— *Tree oven-dry weight to 2-inch top*
(In pounds)

D.b.h. class (in)	Total tree height (feet)							
	40	48	56	64	72	80	88	96
BLACK OAK								
6	105	126	147	168	189	210	231	252
8	199	239	279	319	359	399	439	479
10	328	394	459	525	591	656	722	788
12	493	592	690	789	888	986	1,085	1,184
14	696	835	974	1,113	1,253	1,392	1,531	1,670
16	937	1,125	1,313	1,500	1,688	1,875	2,063	2,251
18	1,220	1,464	1,708	1,952	2,196	2,440	2,684	2,928
20	1,543	1,852	2,161	2,469	2,778	3,087	3,396	3,705
22	1,909	2,291	2,673	3,055	3,437	3,820	4,202	4,584
24	2,319	2,783	3,247	3,711	4,175	4,639	5,103	5,567
26	2,773	3,328	3,882	4,437	4,992	5,547	6,102	6,657
RED OAK								
6	103	122	141	159	177	195	213	231
8	200	236	272	308	343	378	413	447
10	333	394	454	514	573	631	689	746
12	506	599	690	781	870	959	1,047	1,134
14	721	853	984	1,112	1,240	1,366	1,492	1,616
16	980	1,159	1,336	1,511	1,685	1,856	2,027	2,196
18	1,285	1,519	1,751	1,981	2,208	2,433	2,656	2,878
20	1,636	1,935	2,231	2,523	2,812	3,099	3,383	3,665
22	2,036	2,409	2,776	3,140	3,500	3,857	4,211	4,562
24	2,487	2,941	3,390	3,834	4,274	4,709	5,142	5,571
26	2,988	3,535	4,074	4,608	5,136	5,660	6,179	6,695
WHITE OAK								
6	169	169	169	169	169	169	169	169
8	344	344	344	344	344	344	344	344
10	597	597	597	597	597	597	597	598
12	937	937	937	937	937	938	938	938
14	1,371	1,372	1,372	1,372	1,372	1,372	1,372	1,373
16	1,907	1,908	1,908	1,908	1,909	1,909	1,909	1,909
18	2,552	2,553	2,553	2,553	2,554	2,554	2,554	2,555
20	3,311	3,312	3,312	3,313	3,313	3,314	3,314	3,314
22	4,191	4,192	4,192	4,193	4,194	4,194	4,195	4,195
24	5,196	5,197	5,198	5,199	5,200	5,200	5,201	5,201
26	6,333	6,334	6,335	6,336	6,337	6,338	6,339	6,339
HICKORY								
6	172	197	221	244	267	289	310	331
8	308	353	396	437	477	516	554	591
10	483	553	621	685	748	809	869	927
12	698	799	897	990	1,081	1,169	1,255	1,339
14	953	1,091	1,224	1,352	1,476	1,596	1,713	1,828
16	1,247	1,429	1,602	1,770	1,932	2,090	2,243	2,393
18	1,582	1,812	2,032	2,245	2,450	2,650	2,845	3,036
20	1,957	2,241	2,514	2,777	3,031	3,278	3,519	3,755
22	2,372	2,717	3,047	3,365	3,674	3,974	4,266	4,551
24	2,827	3,238	3,632	4,012	4,379	4,737	5,085	5,425
26	3,323	3,806	4,269	4,715	5,147	5,567	5,976	6,376
WHITE ASH								
6	111	129	146	162	178	194	209	225
8	212	246	278	309	340	370	399	428
10	350	405	458	510	560	609	658	705
12	526	609	689	767	842	917	989	1,061
14	743	860	973	1,083	1,190	1,295	1,397	1,498
16	1,002	1,160	1,312	1,460	1,605	1,746	1,884	2,020
18	1,305	1,510	1,708	1,901	2,089	2,273	2,453	2,630
20	1,652	1,912	2,163	2,407	2,645	2,878	3,106	3,330
22	2,045	2,366	2,677	2,980	3,274	3,563	3,845	4,123
24	2,485	2,876	3,253	3,621	3,979	4,329	4,673	5,010
26	2,973	3,440	3,892	4,332	4,760	5,179	5,590	5,994
YELLOW POPLAR								
6	62	85	111	139	171	205	241	280
8	105	144	188	237	290	348	410	477
10	159	218	284	358	439	526	620	720
12	223	305	398	501	614	737	868	1,008
14	297	406	530	667	817	979	1,154	1,341
16	379	520	678	853	1,045	1,253	1,477	1,716
18	472	646	842	1,061	1,299	1,558	1,836	2,133
20	573	785	1,024	1,288	1,578	1,893	2,231	2,592
22	683	936	1,221	1,537	1,882	2,257	2,660	3,091
24	803	1,099	1,434	1,804	2,211	2,651	3,124	3,630
26	931	1,274	1,662	2,092	2,563	3,073	3,622	4,208

Table 7.— *Tree oven-dry weight to 4-inch top*
(In pounds)

D.b.h. class (in)	Total tree height (feet)							
	40	48	56	64	72	80	88	96
BLACK OAK								
6	93	110	128	145	162	179	196	213
8	180	214	248	281	315	348	381	413
10	302	358	415	471	526	581	636	691
12	459	546	631	716	801	885	969	1,052
14	655	778	901	1,022	1,143	1,262	1,382	1,500
16	891	1,059	1,225	1,390	1,554	1,717	1,879	2,041
18	1,168	1,389	1,607	1,823	2,039	2,253	2,465	2,677
20	1,489	1,770	2,048	2,324	2,599	2,871	3,143	3,413
22	1,855	2,205	2,551	2,895	3,237	3,577	3,914	4,251
24	2,267	2,694	3,118	3,538	3,955	4,370	4,783	5,194
26	2,726	3,240	3,749	4,254	4,757	5,256	5,752	6,246
RED OAK								
6	92	108	123	138	153	167	181	196
8	181	212	242	272	301	330	358	386
10	307	360	411	461	510	558	606	653
12	473	553	632	709	784	859	932	1,005
14	680	796	909	1,020	1,129	1,236	1,341	1,446
16	933	1,091	1,246	1,398	1,547	1,694	1,839	1,982
18	1,232	1,441	1,646	1,846	2,043	2,237	2,428	2,617
20	1,580	1,848	2,110	2,367	2,620	2,869	3,114	3,357
22	1,978	2,314	2,643	2,965	3,281	3,593	3,900	4,204
24	2,429	2,842	3,246	3,641	4,030	4,413	4,790	5,163
26	2,935	3,434	3,921	4,399	4,868	5,331	5,787	6,237
WHITE OAK								
6	147	155	161	166	171	176	180	184
8	291	304	317	328	338	347	355	363
10	492	515	536	555	572	587	602	615
12	756	792	824	853	879	903	925	946
14	1,088	1,139	1,185	1,226	1,264	1,298	1,330	1,360
16	1,490	1,561	1,624	1,680	1,732	1,779	1,823	1,863
18	1,967	2,061	2,144	2,218	2,286	2,348	2,406	2,460
20	2,522	2,642	2,748	2,844	2,931	3,011	3,085	3,154
22	3,158	3,308	3,441	3,561	3,669	3,769	3,862	3,949
24	3,877	4,062	4,225	4,371	4,505	4,628	4,742	4,848
26	4,683	4,906	5,103	5,280	5,441	5,589	5,727	5,855
HICKORY								
6	146	166	187	206	225	243	260	278
8	266	304	341	376	410	443	476	507
10	424	485	543	600	654	707	759	809
12	621	710	796	878	958	1,036	1,111	1,185
14	857	981	1,099	1,213	1,323	1,430	1,534	1,636
16	1,133	1,297	1,453	1,604	1,749	1,891	2,029	2,163
18	1,450	1,859	1,859	2,052	2,238	2,419	2,596	2,768
20	1,808	2,068	2,318	2,558	2,790	3,016	3,236	3,451
22	2,207	2,525	2,829	3,123	3,406	3,682	3,950	4,213
24	2,648	3,029	3,394	3,746	4,087	4,417	4,739	5,054
26	3,130	3,582	4,013	4,429	4,832	5,223	5,604	5,975
WHITE ASH								
6	93	111	130	148	167	185	204	222
8	174	209	244	279	314	348	383	418
10	285	342	398	455	512	569	626	683
12	425	510	595	680	765	849	934	1,019
14	596	715	835	954	1,073	1,192	1,311	1,430
16	800	959	1,119	1,279	1,439	1,598	1,758	1,918
18	1,036	1,243	1,450	1,657	1,864	2,071	2,278	2,484
20	1,306	1,567	1,828	2,089	2,349	2,610	2,871	3,132
22	1,610	1,932	2,253	2,575	2,897	3,218	3,540	3,862
24	1,949	2,339	2,728	3,118	3,507	3,897	4,286	4,675
26	2,324	2,789	3,253	3,717	4,182	4,646	5,110	5,574
YELLOW POPLAR								
6	55	78	106	137	172	211	254	301
8	90	128	173	225	282	346	417	493
10	132	188	254	329	414	508	611	724
12	181	258	348	451	566	695	836	990
14	236	336	453	587	738	906	1,090	1,291
16	297	423	570	739	929	1,140	1,371	1,624
18	363	517	698	905	1,137	1,395	1,679	1,988
20	435	620	837	1,084	1,363	1,672	2,012	2,383
22	513	731	986	1,277	1,605	1,970	2,370	2,807
24	595	848	1,144	1,483	1,864	2,288	2,753	3,259
26	683	974	1,313	1,702	2,139	2,625	3,158	3,740

Table 8.— *Tree volume to 2-inch top*
(In cubic feet)

D.b.h. class (in)	Total tree height (feet)							
	40	48	56	64	72	80	88	96
BLACK OAK								
6	2.7	3.2	3.8	4.3	4.9	5.4	6.0	6.5
8	5.1	6.1	7.2	8.2	9.2	10.2	11.3	12.3
10	8.4	10.0	11.7	13.4	15.1	16.8	13.5	20.1
12	12.5	15.0	17.6	20.1	22.6	25.1	27.6	30.1
14	17.6	21.2	24.7	28.2	31.8	35.3	38.9	42.4
16	23.7	28.4	33.2	37.9	42.7	47.5	52.2	57.0
18	30.7	36.9	43.1	49.3	55.4	61.6	67.8	74.0
20	38.8	46.6	54.4	62.2	70.0	77.8	85.6	93.4
22	47.9	57.5	67.2	76.8	86.4	96.1	105.7	115.4
24	58.1	69.8	81.4	93.1	104.8	116.5	128.2	139.9
26	69.4	83.3	97.2	111.2	125.1	139.1	153.1	167.0
RED OAK								
6	2.7	3.2	3.7	4.1	4.6	5.1	5.5	6.0
8	5.2	6.1	7.0	8.0	8.9	9.8	10.7	11.5
10	8.6	10.2	11.7	13.3	14.8	16.3	17.7	19.2
12	13.1	15.5	17.8	20.1	22.4	24.7	26.9	29.1
14	18.6	22.0	25.3	28.6	31.9	35.1	38.3	41.4
16	25.3	29.8	34.4	38.8	43.2	47.6	51.9	56.2
18	33.1	39.1	45.0	50.8	56.6	62.3	68.0	73.6
20	42.1	49.7	57.2	64.6	72.0	79.3	86.5	93.7
22	52.3	61.8	71.1	80.4	89.5	98.6	107.5	116.5
24	63.8	75.4	86.8	98.1	109.2	120.3	131.2	142.1
26	76.6	90.5	104.2	117.7	131.1	144.4	157.6	170.6
WHITE OAK								
6	4.0	4.1	4.1	4.2	4.2	4.3	4.3	4.3
8	8.0	8.1	8.2	8.3	8.4	8.5	8.6	8.6
10	13.7	13.9	14.1	14.2	14.4	14.5	14.6	14.7
12	21.1	21.5	21.7	22.0	22.2	22.4	22.6	22.7
14	30.6	31.0	31.4	31.8	32.1	32.4	32.6	32.9
16	42.1	42.7	43.3	43.8	44.2	44.6	44.9	45.3
18	55.8	56.6	57.4	58.0	58.6	59.1	59.5	60.0
20	71.8	72.9	73.8	74.6	75.4	76.0	76.6	77.2
22	90.2	91.5	92.7	93.7	94.7	95.5	96.2	96.9
24	111.0	112.7	114.2	115.4	116.6	117.6	118.5	119.4
26	134.4	136.5	138.2	139.8	141.2	142.4	143.5	144.6
HICKORY								
6	3.8	4.4	4.9	5.4	5.9	6.4	6.9	7.3
8	6.8	7.8	8.8	9.7	10.6	11.5	12.3	13.1
10	10.7	12.3	13.8	15.2	16.6	18.0	19.3	20.6
12	15.5	17.8	19.9	22.0	24.0	26.0	27.9	29.8
14	21.2	24.3	27.2	30.1	32.8	35.5	38.1	40.7
16	27.7	31.8	35.6	39.4	43.0	46.5	49.9	53.3
18	35.2	40.3	45.2	49.9	54.5	59.0	63.3	67.6
20	43.5	49.8	55.9	61.8	67.5	73.0	78.4	83.6
22	52.7	60.4	67.8	74.9	81.8	88.5	95.0	101.4
24	62.9	72.0	80.8	89.3	97.5	105.5	113.2	120.8
26	73.9	84.7	95.0	104.9	114.6	124.0	133.1	142.0
WHITE ASH								
6	3.0	3.5	3.9	4.4	4.9	5.3	5.8	6.2
8	5.6	6.5	7.4	8.3	9.2	10.0	10.9	11.7
10	9.2	10.7	12.2	13.6	15.1	16.5	17.8	19.2
12	13.8	16.0	18.3	20.4	22.6	24.7	26.7	28.8
14	19.4	22.6	25.7	28.8	31.8	34.7	37.6	40.5
16	26.0	30.4	34.6	38.7	42.7	46.7	50.6	54.4
18	33.8	39.4	44.9	50.2	55.5	60.6	65.7	70.6
20	42.7	49.8	56.7	63.4	70.0	76.5	82.9	89.2
22	52.7	61.5	70.0	78.3	86.5	94.5	102.4	110.2
24	64.0	74.6	84.9	95.0	104.9	114.6	124.2	133.7
26	76.4	89.1	101.4	113.5	125.3	136.9	148.3	159.6
YELLOW POPLAR								
6	2.0	2.8	3.7	4.7	5.8	6.9	8.2	9.6
8	3.4	4.7	6.2	7.9	9.7	11.7	13.9	16.2
10	5.1	7.1	9.3	11.8	14.6	17.6	20.8	24.3
12	7.1	9.8	13.0	16.5	20.3	24.5	29.0	33.9
14	9.4	13.0	17.2	21.8	26.9	32.4	38.4	44.9
16	12.0	16.6	21.9	27.8	34.2	41.3	49.0	57.2
18	14.9	20.6	27.1	34.4	42.4	51.2	60.7	70.9
20	18.0	24.9	32.8	41.6	51.4	62.0	73.5	85.8
22	21.4	29.6	39.0	49.5	61.1	73.7	87.4	102.0
24	25.1	34.7	45.7	58.0	71.6	86.4	102.4	119.5
26	29.0	40.2	52.9	67.1	82.8	99.9	118.4	138.3

Table 9. — *Tree volume to 4-inch top*
(In cubic feet)

D.b.h. class (in)	Total tree height (feet)							
	40	48	56	64	72	80	88	96
BLACK OAK								
6	2.4	2.9	3.3	3.8	4.2	4.6	5.1	5.5
8	4.6	5.5	6.4	7.2	8.1	8.9	9.8	10.6
10	7.7	9.1	10.6	12.0	13.4	14.9	16.3	17.7
12	11.6	13.8	16.0	18.2	20.4	22.5	24.7	26.8
14	16.5	19.6	22.8	25.9	28.9	32.0	35.1	38.1
16	22.4	26.6	30.9	35.1	39.2	43.4	47.5	51.6
18	29.3	34.8	40.4	45.8	51.3	56.7	62.1	67.5
20	37.2	44.3	51.3	58.3	65.2	72.1	79.0	85.9
22	46.2	55.0	63.7	72.4	81.0	89.6	98.2	106.7
24	56.3	67.1	77.7	88.3	98.8	109.3	119.7	130.1
26	67.6	80.5	93.3	105.9	118.6	131.1	143.6	156.1
RED OAK								
6	2.4	2.8	3.2	3.6	4.0	4.3	4.7	5.1
8	4.7	5.5	6.3	7.0	7.8	8.5	9.2	10.0
10	8.0	9.3	10.6	11.9	13.1	14.4	15.6	16.8
12	12.2	14.3	16.3	18.2	20.2	22.1	23.9	25.8
14	17.5	20.5	23.4	26.2	29.0	31.7	34.4	37.0
16	24.0	28.0	32.0	35.8	39.6	43.4	47.1	50.7
18	31.6	37.0	42.2	47.3	52.3	57.2	62.1	66.8
20	40.5	47.3	54.0	60.5	66.9	73.3	79.5	85.6
22	50.6	59.2	67.5	75.7	83.7	91.6	99.4	107.1
24	62.1	72.6	82.8	92.9	102.7	112.4	121.9	131.4
26	75.0	87.6	100.0	112.1	124.0	135.6	147.2	158.5
WHITE OAK								
6	3.6	3.8	3.9	4.0	4.2	4.3	4.4	4.5
8	7.1	7.4	7.7	8.0	8.2	8.4	8.6	8.8
10	12.0	12.5	13.0	13.5	13.9	14.3	14.6	15.0
12	18.4	19.2	20.0	20.7	21.4	21.9	22.5	23.0
14	26.4	27.7	28.8	29.8	30.7	31.6	32.3	33.1
16	36.2	37.9	39.5	40.8	42.1	43.2	44.3	45.3
18	47.8	50.1	52.1	53.9	55.6	57.1	58.5	59.8
20	61.2	64.2	66.8	69.1	71.2	73.2	75.0	76.7
22	76.7	80.3	83.6	86.5	89.2	91.6	93.9	96.0
24	94.1	98.6	102.6	106.2	109.5	112.5	115.3	117.9
26	113.7	119.1	123.9	128.3	132.2	135.8	139.2	142.3
HICKORY								
6	3.3	3.7	4.2	4.6	5.0	5.4	5.8	6.2
8	5.9	6.8	7.6	8.4	9.2	9.9	10.6	11.3
10	9.5	10.8	12.1	13.4	14.6	15.8	16.9	18.1
12	13.9	15.9	17.8	19.6	21.4	23.1	24.8	26.5
14	19.1	21.9	24.5	27.1	29.5	31.9	34.3	36.5
16	25.3	28.9	32.4	35.8	39.1	42.2	45.3	48.3
18	32.4	37.0	41.5	45.8	50.0	54.0	57.9	61.8
20	40.3	46.1	51.7	57.1	62.3	67.3	72.2	77.0
22	49.2	56.3	63.1	69.7	76.0	82.2	88.2	94.0
24	59.1	67.6	75.7	83.6	91.2	98.6	105.8	112.8
26	69.8	79.9	89.5	98.8	107.8	116.5	125.0	133.3
WHITE ASH								
6	2.5	3.0	3.5	4.0	4.6	5.1	5.6	6.1
8	4.7	5.6	6.6	7.6	8.5	9.5	10.5	11.5
10	7.6	9.2	10.7	12.3	13.9	15.5	17.1	18.7
12	11.3	13.6	16.0	18.3	20.7	23.0	25.4	27.7
14	15.8	19.1	22.3	25.6	28.9	32.2	35.5	38.8
16	21.2	25.5	29.9	34.2	38.6	43.0	47.5	51.9
18	27.3	33.0	38.6	44.3	49.9	55.6	61.3	67.0
20	34.4	41.4	48.5	55.7	62.8	70.0	77.1	84.3
22	42.3	51.0	59.7	68.5	77.3	86.1	94.9	103.8
24	51.1	61.6	72.2	82.8	93.4	104.0	114.7	125.4
26	60.9	73.4	85.9	98.5	111.2	123.9	136.6	149.3
YELLOW POPLAR								
6	1.8	2.6	3.6	4.6	5.9	7.2	8.7	10.3
8	3.0	4.3	5.8	7.6	9.6	11.8	14.2	16.9
10	4.4	6.3	8.5	11.1	14.0	17.2	20.8	24.7
12	6.0	8.6	11.6	15.1	19.1	23.5	28.4	33.7
14	7.8	11.1	15.1	19.7	24.8	30.6	36.9	43.9
16	9.8	14.0	19.0	24.7	31.2	38.4	46.4	55.1
18	11.9	17.1	23.2	30.2	38.1	46.9	56.7	67.3
20	14.3	20.5	27.8	36.1	45.6	56.2	67.8	80.6
22	16.8	24.1	32.7	42.5	53.7	66.1	79.8	94.8
24	19.5	27.9	37.9	49.3	62.2	76.7	92.5	109.9
26	22.3	32.0	43.4	56.5	71.3	87.9	106.1	126.0

Table 10.— *Total tree green weight*
(In kilograms)

D.b.h. class (cm)	Total tree height (meters)						
	12	15	18	21	24	27	30
BLACK OAK							
15	118	144	170	196	221	245	270
20	220	269	317	365	412	458	503
25	357	437	515	592	668	743	817
30	530	649	765	879	991	1,102	1,212
35	741	906	1,068	1,227	1,385	1,540	1,694
40	989	1,210	1,427	1,640	1,850	2,057	2,262
45	1,277	1,562	1,842	2,116	2,388	2,655	2,920
50	1,605	1,963	2,314	2,660	3,000	3,337	3,670
55	1,973	2,413	2,845	3,270	3,689	4,103	4,512
60	2,383	2,915	3,436	3,949	4,455	4,954	5,448
RED OAK							
15	89	114	140	166	192	218	245
20	174	222	271	322	373	424	477
25	291	372	454	539	624	710	798
30	443	566	692	820	951	1,082	1,216
35	632	808	988	1,171	1,357	1,545	1,735
40	860	1,100	1,345	1,594	1,847	2,103	2,362
45	1,129	1,444	1,765	2,092	2,424	2,760	3,100
50	1,440	1,842	2,252	2,669	3,092	3,520	3,953
55	1,795	2,295	2,806	3,325	3,853	4,387	4,927
60	2,194	2,806	3,430	4,065	4,710	5,363	6,023
WHITE OAK							
15	151	168	184	198	211	224	235
20	287	319	348	375	400	424	446
25	471	524	572	616	657	696	732
30	706	786	858	924	985	1,043	1,097
35	994	1,107	1,208	1,301	1,388	1,469	1,545
40	1,337	1,489	1,626	1,751	1,867	1,976	2,079
45	1,737	1,934	2,112	2,275	2,426	2,568	2,701
50	2,195	2,444	2,669	2,875	3,066	3,245	3,414
55	2,713	3,021	3,298	3,553	3,789	4,010	4,219
60	3,292	3,665	4,002	4,310	4,597	4,865	5,119
HICKORY							
15	188	225	260	294	327	360	391
20	320	383	443	501	558	613	667
25	484	579	670	758	844	927	1,008
30	679	812	939	1,063	1,183	1,299	1,414
35	904	1,080	1,250	1,414	1,574	1,729	1,881
40	1,157	1,384	1,601	1,811	2,015	2,215	2,409
45	1,440	1,721	1,992	2,253	2,507	2,755	2,997
50	1,750	2,092	2,421	2,739	3,048	3,349	3,643
55	2,088	2,497	2,889	3,268	3,636	3,996	4,347
60	2,454	2,933	3,394	3,840	4,273	4,695	5,108
WHITE ASH							
15	121	135	148	160	172	182	192
20	230	258	283	306	327	347	366
25	380	425	466	504	539	572	604
30	572	640	702	759	811	861	908
35	808	904	991	1,072	1,147	1,217	1,283
40	1,089	1,219	1,337	1,446	1,547	1,642	1,731
45	1,419	1,588	1,741	1,883	2,014	2,138	2,255
50	1,797	2,011	2,205	2,384	2,551	2,707	2,856
55	2,225	2,490	2,731	2,952	3,158	3,352	3,536
60	2,704	3,027	3,319	3,588	3,839	4,074	4,297
YELLOW POPLAR							
15	101	131	163	195	229	263	298
20	169	221	274	329	385	443	502
25	254	330	410	492	577	663	752
30	353	460	570	685	803	923	1,046
35	466	607	754	905	1,061	1,220	1,382
40	594	773	960	1,153	1,351	1,553	1,760
45	735	957	1,188	1,427	1,672	1,922	2,178
50	889	1,158	1,438	1,727	2,023	2,326	2,636
55	1,056	1,376	1,709	2,052	2,404	2,764	3,132
60	1,236	1,611	2,000	2,402	2,814	3,236	3,667

Table 11.— *Tree green weight to 5-centimeter top*
(In kilograms)

D.b.h. class (cm)	Total tree height (meters)						
	12	15	18	21	24	27	30
BLACK OAK							
15	90	113	135	158	181	203	226
20	172	215	258	301	344	387	430
25	283	354	425	496	566	637	708
30	426	533	639	745	852	958	1,065
35	602	752	902	1,052	1,203	1,353	1,503
40	811	1,014	1,216	1,419	1,622	1,824	2,027
45	1,056	1,319	1,583	1,847	2,111	2,374	2,638
50	1,336	1,670	2,004	2,338	2,672	3,005	3,339
55	1,654	2,067	2,480	2,894	3,307	3,720	4,133
60	2,009	2,511	3,014	3,515	4,017	4,519	5,021
RED OAK							
15	90	110	130	150	170	190	209
20	174	213	253	291	329	367	405
25	290	357	422	486	550	613	676
30	441	542	642	740	837	933	1,028
35	629	773	914	1,054	1,193	1,330	1,466
40	855	1,050	1,243	1,433	1,621	1,807	1,992
45	1,121	1,377	1,630	1,879	2,125	2,370	2,612
50	1,428	1,754	2,076	2,394	2,708	3,019	3,328
55	1,777	2,184	2,585	2,980	3,371	3,759	4,143
60	2,171	2,668	3,157	3,640	4,118	4,591	5,060
WHITE OAK							
15	129	129	130	130	131	131	131
20	263	264	265	266	267	267	268
25	458	460	461	463	464	465	466
30	720	723	725	727	729	731	732
35	1,056	1,060	1,063	1,066	1,069	1,071	1,073
40	1,471	1,477	1,481	1,485	1,489	1,492	1,494
45	1,970	1,978	1,984	1,989	1,994	1,998	2,002
50	2,559	2,569	2,577	2,584	2,590	2,595	2,600
55	3,242	3,254	3,265	3,273	3,281	3,288	3,294
60	4,023	4,038	4,051	4,062	4,072	4,080	4,088
HICKORY							
15	137	162	185	207	229	250	270
20	245	289	331	371	409	446	482
25	385	454	519	582	642	700	757
30	556	656	750	841	928	1,012	1,093
35	759	895	1,024	1,147	1,266	1,381	1,493
40	994	1,172	1,341	1,502	1,658	1,808	1,954
45	1,261	1,487	1,701	1,905	2,103	2,293	2,479
50	1,560	1,839	2,104	2,357	2,601	2,837	3,066
55	1,891	2,229	2,550	2,857	3,153	3,439	3,717
60	2,254	2,657	3,039	3,405	3,758	4,099	4,430
WHITE ASH							
15	66	92	120	150	182	216	252
20	115	159	208	260	316	375	438
25	177	245	319	399	485	576	672
30	251	347	453	567	689	818	954
35	337	467	609	762	926	1,099	1,282
40	436	603	787	985	1,197	1,421	1,657
45	546	756	986	1,235	1,500	1,782	2,077
50	669	926	1,208	1,512	1,837	2,181	2,543
55	803	1,112	1,450	1,816	2,206	2,619	3,054
60	949	1,314	1,714	2,146	2,607	3,095	3,609
YELLOW POPLAR							
15	52	76	104	136	172	211	253
20	88	130	178	232	292	359	430
25	133	196	268	350	442	542	650
30	186	274	376	491	619	759	911
35	248	364	500	653	823	1,009	1,211
40	317	466	640	836	1,053	1,291	1,550
45	394	580	795	1,039	1,309	1,605	1,927
50	479	705	966	1,262	1,591	1,951	2,341
55	571	840	1,152	1,505	1,897	2,326	2,792
60	671	987	1,354	1,768	2,228	2,732	3,279

Table 12.— *Tree green weight to 10-centimeter top*
(In kilograms)

D.b.h. class (cm)	Total tree height (meters)						
	12	15	18	21	24	27	30
BLACK OAK							
15	80	99	117	136	154	172	190
20	155	192	228	264	299	334	369
25	260	321	382	441	501	560	618
30	396	489	581	672	763	853	942
35	566	698	830	960	1,089	1,218	1,345
40	770	951	1,130	1,307	1,483	1,657	1,831
45	1,011	1,248	1,483	1,715	1,946	2,175	2,403
50	1,289	1,592	1,891	2,188	2,482	2,775	3,065
55	1,606	1,984	2,357	2,727	3,093	3,458	3,820
60	1,964	2,425	2,881	3,333	3,782	4,227	4,670
RED OAK							
15	80	97	113	129	145	161	176
20	158	191	224	256	287	317	348
25	267	324	379	433	486	538	589
30	412	499	584	667	748	828	907
35	593	718	841	960	1,078	1,193	1,306
40	813	985	1,153	1,317	1,478	1,636	1,791
45	1,074	1,302	1,524	1,740	1,953	2,161	2,367
50	1,378	1,670	1,955	2,233	2,505	2,773	3,037
55	1,726	2,093	2,449	2,798	3,139	3,475	3,805
60	2,121	2,571	3,009	3,437	3,856	4,269	4,675
WHITE OAK							
15	116	121	126	130	133	136	139
20	231	241	250	258	265	272	277
25	394	412	427	441	453	464	474
30	610	638	662	683	701	718	733
35	883	924	958	988	1,015	1,039	1,061
40	1,216	1,272	1,319	1,361	1,398	1,431	1,462
45	1,613	1,687	1,750	1,805	1,854	1,898	1,939
50	2,077	2,172	2,253	2,324	2,387	2,444	2,496
55	2,611	2,730	2,832	2,921	3,000	3,072	3,137
60	3,216	3,364	3,489	3,598	3,696	3,784	3,865
HICKORY							
15	115	135	154	173	190	207	224
20	210	247	282	316	348	379	410
25	335	394	450	504	556	606	654
30	491	578	660	739	815	888	959
35	678	798	912	1,021	1,125	1,227	1,325
40	898	1,056	1,207	1,351	1,489	1,623	1,753
45	1,149	1,353	1,545	1,729	1,907	2,078	2,244
50	1,433	1,687	1,927	2,157	2,378	2,592	2,799
55	1,750	2,060	2,354	2,634	2,904	3,165	3,418
60	2,101	2,473	2,825	3,162	3,486	3,799	4,103
WHITE ASH							
15	69	86	103	119	136	153	169
20	130	162	194	226	257	289	320
25	214	266	318	370	421	473	524
30	320	398	476	554	631	708	785
35	450	560	670	779	888	996	1,104
40	605	753	900	1,047	1,193	1,339	1,484
45	786	978	1,169	1,359	1,549	1,738	1,927
50	992	1,235	1,476	1,716	1,956	2,195	2,433
55	1,225	1,525	1,822	2,119	2,415	2,710	3,005
60	1,486	1,848	2,210	2,569	2,928	3,286	3,643
YELLOW POPLAR							
15	48	73	104	140	182	228	280
20	78	120	171	231	298	375	459
25	115	177	251	339	438	550	674
30	157	242	344	463	600	753	923
35	205	315	449	604	782	982	1,204
40	258	397	565	761	985	1,236	1,515
45	316	486	692	932	1,206	1,514	1,856
50	379	583	829	1,117	1,446	1,816	2,226
55	446	687	977	1,317	1,704	2,140	2,623
60	519	798	1,135	1,529	1,980	2,485	3,047

Table 13.— *Tree oven-dry weight to 5-centimeter top*
(In kilograms)

D.b.h. class (cm)	Total tree height (meters)						
	12	15	18	21	24	27	30
BLACK OAK							
15	45	56	68	79	90	102	113
20	86	107	129	150	172	193	215
25	141	177	212	247	283	318	354
30	212	266	319	372	425	478	531
35	300	375	450	525	600	675	750
40	404	505	606	707	808	909	1,010
45	526	657	788	920	1,051	1,183	1,314
50	665	831	998	1,164	1,330	1,497	1,663
55	823	1,028	1,234	1,440	1,646	1,852	2,058
60	999	1,249	1,499	1,749	1,999	2,249	2,499
RED OAK							
15	44	55	65	74	84	94	103
20	86	106	125	144	163	182	200
25	144	176	209	240	272	303	334
30	218	268	317	365	413	461	508
35	311	382	452	521	589	656	723
40	422	519	614	707	800	892	983
45	554	680	804	927	1,049	1,169	1,288
50	705	866	1,025	1,181	1,336	1,489	1,640
55	878	1,078	1,275	1,470	1,662	1,853	2,042
60	1,072	1,316	1,557	1,795	2,030	2,263	2,493
WHITE OAK							
15	74	74	74	74	74	74	74
20	150	150	150	150	150	150	150
25	260	260	260	261	261	261	261
30	409	409	409	409	409	409	409
35	598	598	598	598	599	599	599
40	832	832	832	832	833	833	833
45	1,113	1,113	1,114	1,114	1,114	1,114	1,114
50	1,444	1,445	1,445	1,445	1,445	1,445	1,446
55	1,828	1,828	1,829	1,829	1,829	1,829	1,830
60	2,266	2,267	2,267	2,268	2,268	2,268	2,269
HICKORY							
15	75	88	101	113	125	137	148
20	134	158	181	203	224	244	264
25	210	248	284	318	351	384	415
30	303	358	410	460	508	554	599
35	414	488	559	627	693	756	818
40	541	639	732	821	907	990	1,071
45	687	811	929	1,042	1,151	1,256	1,359
50	850	1,003	1,149	1,289	1,423	1,554	1,680
55	1,030	1,216	1,393	1,562	1,725	1,883	2,037
60	1,227	1,449	1,660	1,862	2,056	2,245	2,428
WHITE ASH							
15	48	58	67	75	84	92	100
20	92	110	127	144	160	176	191
25	151	181	209	237	263	289	315
30	227	272	315	356	396	435	474
35	321	384	444	503	560	615	669
40	433	518	599	678	755	829	902
45	564	674	780	883	982	1,080	1,175
50	714	854	988	1,118	1,244	1,367	1,487
55	884	1,057	1,223	1,384	1,540	1,692	1,841
60	1,074	1,284	1,486	1,681	1,871	2,056	2,237
YELLOW POPLAR							
15	27	39	53	70	88	107	129
20	45	66	91	119	149	183	219
25	68	100	137	179	225	276	331
30	96	140	192	251	316	387	464
35	127	187	256	333	420	514	617
40	163	239	327	427	537	658	789
45	202	297	407	530	668	818	981
50	246	361	494	644	811	994	1,192
55	293	430	589	769	967	1,185	1,421
60	344	505	692	903	1,136	1,392	1,669

Table 14.— Tree oven-dry weight to 10-centimeter top (In kilograms)

D.b.h. class (cm)	Total tree height (meters)						
	12	15	18	21	24	27	30
BLACK OAK							
15	40	49	59	68	77	86	95
20	78	96	114	132	150	167	185
25	130	161	191	221	250	280	309
30	198	244	290	336	381	426	471
35	282	348	414	479	544	608	672
40	384	474	563	652	740	827	914
45	503	622	739	855	970	1,085	1,199
50	642	793	942	1,090	1,237	1,383	1,528
55	799	987	1,173	1,358	1,541	1,723	1,903
60	977	1,206	1,434	1,659	1,883	2,105	2,326
RED OAK							
15	40	48	56	64	72	80	87
20	78	95	111	127	142	157	172
25	132	161	188	214	241	266	292
30	204	247	289	330	370	410	448
35	293	355	416	475	533	589	645
40	402	487	570	651	730	808	885
45	531	643	753	859	964	1,067	1,168
50	681	825	965	1,102	1,236	1,368	1,498
55	853	1,033	1,209	1,380	1,549	1,714	1,877
60	1,047	1,269	1,485	1,695	1,902	2,105	2,305
WHITE OAK							
15	64	68	71	74	77	79	81
20	126	134	140	146	151	156	160
25	214	227	237	247	256	263	270
30	329	348	365	380	393	405	416
35	473	501	525	546	565	582	598
40	648	687	719	748	774	798	819
45	856	906	950	988	1,022	1,053	1,082
50	1,098	1,162	1,217	1,266	1,310	1,350	1,387
55	1,374	1,455	1,524	1,585	1,640	1,690	1,736
60	1,687	1,786	1,871	1,946	2,014	2,075	2,132
HICKORY							
15	63	74	85	95	105	115	124
20	115	136	155	174	192	210	227
25	184	217	248	278	307	335	362
30	269	317	363	407	449	490	530
35	372	438	501	562	620	676	731
40	491	580	663	743	820	894	967
45	629	742	848	951	1,049	1,145	1,237
50	784	924	1,058	1,185	1,308	1,427	1,542
55	957	1,128	1,291	1,447	1,597	1,742	1,883
60	1,148	1,354	1,549	1,736	1,916	2,090	2,259
WHITE ASH							
15	40	50	60	70	80	90	100
20	75	94	113	131	150	169	188
25	123	153	184	215	245	276	307
30	183	229	275	320	366	412	458
35	257	321	386	450	514	578	642
40	345	431	517	603	689	775	861
45	447	558	670	781	893	1,004	1,116
50	563	704	844	985	1,125	1,266	1,407
55	694	868	1,041	1,214	1,388	1,561	1,734
60	840	1,050	1,260	1,470	1,680	1,890	2,100
YELLOW POPLAR							
15	24	36	52	70	90	114	139
20	39	60	85	114	148	186	229
25	57	87	124	168	217	273	335
30	77	119	170	230	297	374	459
35	101	156	222	299	388	487	598
40	127	196	279	376	488	613	752
45	155	240	342	461	597	751	921
50	186	287	409	552	716	900	1,104
55	219	338	482	651	843	1,060	1,300
60	255	393	560	755	979	1,231	1,510

Table 15.— *Tree volume to 5-centimeter top*

(In kilograms)

D.b.h. class (cm)	Total tree height (meters)						
	12	15	18	21	24	27	30
BLACK OAK							
15	0.07	0.09	0.11	0.13	0.15	0.16	0.18
20	0.14	0.17	0.21	0.24	0.28	0.31	0.34
25	0.23	0.28	0.34	0.39	0.45	0.51	0.56
30	0.34	0.42	0.51	0.59	0.68	0.76	0.85
35	0.47	0.59	0.71	0.83	0.95	1.07	1.19
40	0.64	0.80	0.96	1.12	1.28	1.44	1.60
45	0.83	1.03	1.24	1.45	1.66	1.87	2.07
50	1.04	1.31	1.57	1.83	2.09	2.36	2.62
55	1.29	1.61	1.94	2.26	2.59	2.91	3.23
60	1.56	1.96	2.35	2.74	3.14	3.53	3.92
RED OAK							
15	0.07	0.09	0.10	0.12	0.14	0.15	0.17
20	0.14	0.17	0.20	0.23	0.26	0.29	0.32
25	0.23	0.28	0.34	0.39	0.44	0.49	0.54
30	0.35	0.43	0.51	0.59	0.66	0.74	0.81
35	0.50	0.61	0.73	0.84	0.94	1.05	1.16
40	0.68	0.83	0.98	1.13	1.28	1.43	1.57
45	0.89	1.09	1.29	1.48	1.68	1.87	2.06
50	1.13	1.39	1.64	1.89	2.13	2.38	2.62
55	1.41	1.73	2.04	2.35	2.65	2.96	3.25
60	1.72	2.11	2.49	2.86	3.24	3.61	3.97
WHITE OAK							
15	0.11	0.11	0.11	0.11	0.12	0.12	0.12
20	0.22	0.22	0.23	0.23	0.23	0.23	0.24
25	0.37	0.38	0.38	0.39	0.39	0.40	0.40
30	0.58	0.59	0.60	0.60	0.61	0.62	0.62
35	0.83	0.85	0.86	0.87	0.88	0.89	0.90
40	1.15	1.17	1.19	1.20	1.21	1.23	1.24
45	1.52	1.55	1.57	1.59	1.61	1.62	1.64
50	1.95	1.99	2.02	2.05	2.07	2.09	2.11
55	2.45	2.50	2.54	2.57	2.60	2.63	2.65
60	3.02	3.08	3.13	3.17	3.20	3.23	3.26
HICKORY							
15	0.10	0.12	0.14	0.16	0.17	0.19	0.21
20	0.19	0.22	0.25	0.28	0.31	0.34	0.37
25	0.29	0.34	0.39	0.44	0.49	0.53	0.58
30	0.42	0.50	0.57	0.64	0.70	0.77	0.83
35	0.57	0.68	0.78	0.87	0.96	1.05	1.14
40	0.75	0.89	1.02	1.14	1.26	1.38	1.49
45	0.95	1.13	1.29	1.45	1.60	1.75	1.89
50	1.18	1.39	1.60	1.79	1.98	2.16	2.34
55	1.43	1.69	1.93	2.17	2.40	2.62	2.83
60	1.70	2.01	2.31	2.59	2.86	3.12	3.38
WHITE ASH							
15	0.08	0.10	0.11	0.13	0.14	0.16	0.17
20	0.15	0.18	0.21	0.24	0.27	0.30	0.33
25	0.25	0.30	0.35	0.40	0.44	0.49	0.54
30	0.37	0.45	0.52	0.59	0.67	0.73	0.80
35	0.52	0.63	0.74	0.84	0.94	1.03	1.13
40	0.70	0.85	0.99	1.13	1.26	1.39	1.52
45	0.91	1.10	1.28	1.46	1.63	1.81	1.97
50	1.15	1.39	1.62	1.85	2.06	2.28	2.49
55	1.42	1.72	2.00	2.28	2.55	2.82	3.08
60	1.73	2.08	2.43	2.76	3.09	3.42	3.73
YELLOW POPLAR							
15	0.05	0.08	0.11	0.15	0.19	0.23	0.28
20	0.09	0.14	0.19	0.25	0.31	0.39	0.47
25	0.14	0.20	0.28	0.37	0.47	0.58	0.70
30	0.19	0.28	0.39	0.52	0.66	0.81	0.98
35	0.25	0.37	0.52	0.68	0.87	1.07	1.29
40	0.32	0.48	0.66	0.87	1.11	1.36	1.65
45	0.40	0.59	0.82	1.08	1.37	1.69	2.04
50	0.48	0.72	0.99	1.31	1.66	2.05	2.47
55	0.57	0.85	1.18	1.55	1.97	2.43	2.94
60	0.67	1.00	1.38	1.82	2.31	2.85	3.44

Table 16.— *Tree volume to 10-centimeter top* (In kilograms)

D.b.h. class (cm)	Total tree height (meters)						
	12	15	18	21	24	27	30
BLACK OAK							
15	0.06	0.08	0.09	0.11	0.12	0.14	0.15
20	0.12	0.15	0.18	0.21	0.24	0.27	0.30
25	0.21	0.26	0.30	0.35	0.40	0.45	0.50
30	0.31	0.39	0.46	0.53	0.61	0.68	0.75
35	0.44	0.55	0.65	0.76	0.86	0.96	1.07
40	0.60	0.74	0.89	1.03	1.17	1.31	1.44
45	0.79	0.97	1.16	1.34	1.53	1.71	1.89
50	1.00	1.24	1.47	1.71	1.94	2.17	2.40
55	1.24	1.54	1.83	2.12	2.41	2.70	2.98
60	1.52	1.88	2.23	2.59	2.94	3.29	3.64
RED OAK							
15	0.06	0.08	0.09	0.10	0.12	0.13	0.14
20	0.13	0.15	0.18	0.20	0.23	0.25	0.28
25	0.21	0.26	0.30	0.35	0.39	0.43	0.47
30	0.33	0.40	0.46	0.53	0.59	0.66	0.72
35	0.47	0.57	0.67	0.76	0.85	0.94	1.03
40	0.65	0.78	0.91	1.04	1.17	1.29	1.41
45	0.85	1.03	1.20	1.37	1.54	1.70	1.86
50	1.09	1.32	1.54	1.76	1.97	2.18	2.39
55	1.36	1.65	1.93	2.20	2.47	2.73	2.98
60	1.67	2.02	2.37	2.70	3.03	3.35	3.66
WHITE OAK							
15	0.10	0.10	0.11	0.11	0.12	0.12	0.12
20	0.19	0.20	0.21	0.22	0.23	0.24	0.24
25	0.32	0.34	0.36	0.37	0.39	0.40	0.41
30	0.50	0.53	0.55	0.58	0.60	0.61	0.63
35	0.72	0.76	0.80	0.83	0.86	0.88	0.91
40	0.98	1.04	1.09	1.14	1.17	1.21	1.24
45	1.30	1.37	1.44	1.50	1.55	1.60	1.64
50	1.66	1.76	1.85	1.92	1.99	2.05	2.11
55	2.08	2.21	2.31	2.41	2.49	2.57	2.64
60	2.56	2.71	2.84	2.95	3.06	3.15	3.24
HICKORY							
15	0.09	0.10	0.12	0.13	0.15	0.16	0.17
20	0.16	0.19	0.22	0.24	0.27	0.29	0.32
25	0.26	0.30	0.35	0.39	0.43	0.47	0.50
30	0.38	0.44	0.51	0.57	0.63	0.68	0.74
35	0.52	0.61	0.70	0.78	0.86	0.94	1.02
40	0.68	0.81	0.92	1.04	1.14	1.25	1.35
45	0.88	1.03	1.18	1.32	1.46	1.60	1.72
50	1.09	1.29	1.47	1.65	1.82	1.99	2.15
55	1.33	1.57	1.80	2.02	2.22	2.43	2.62
60	1.60	1.89	2.16	2.42	2.67	2.91	3.15
WHITE ASH							
15	0.07	0.08	0.10	0.12	0.14	0.15	0.17
20	0.13	0.16	0.19	0.22	0.26	0.29	0.32
25	0.20	0.26	0.31	0.36	0.42	0.47	0.52
30	0.30	0.38	0.46	0.54	0.62	0.70	0.78
35	0.43	0.54	0.65	0.76	0.87	0.98	1.09
40	0.57	0.72	0.86	1.01	1.16	1.31	1.46
45	0.74	0.92	1.11	1.31	1.50	1.69	1.88
50	0.93	1.16	1.40	1.64	1.88	2.12	2.37
55	1.14	1.43	1.73	2.02	2.32	2.61	2.91
60	1.38	1.73	2.09	2.44	2.80	3.16	3.52
YELLOW POPLAR							
15	0.05	0.08	0.11	0.15	0.19	0.24	0.30
20	0.08	0.12	0.18	0.24	0.31	0.40	0.49
25	0.12	0.18	0.26	0.35	0.46	0.58	0.72
30	0.16	0.25	0.36	0.48	0.63	0.79	0.98
35	0.21	0.32	0.46	0.63	0.82	1.03	1.27
40	0.26	0.41	0.58	0.79	1.03	1.29	1.59
45	0.32	0.50	0.71	0.96	1.25	1.58	1.95
50	0.38	0.59	0.85	1.15	1.50	1.89	2.33
55	0.45	0.70	1.00	1.36	1.77	2.23	2.74
60	0.52	0.81	1.16	1.57	2.05	2.58	3.18

Table 17. *Equation coefficients*[1]—$W = aD^bH^c$

Table reference	Species	a	b	c
3	Black oak	0.20110	2.16790	0.90260
	Red oak	0.05700	2.30890	1.10200
	White oak	1.09890	2.22180	0.48180
	Hickory	0.81630	1.85320	0.80010
	White ash	0.77560	2.24202	0.50569
	Yellow poplar	0.11415	1.80992	1.18635
4	Black oak	0.09530	2.23760	1.99950
	Red oak	0.11210	2.29900	0.92350
	White oak	3.25212	2.48148	0.01744
	Hickory	0.55940	2.01840	0.73760
	White ash	0.02277	1.92041	1.45806
	Yellow poplar	0.00738	1.84840	1.73228
5	Black oak	0.09050	2.30940	0.94550
	Red oak	0.11100	2.36560	0.86250
	White oak	1.72720	2.39810	0.20060
	Hickory	0.41710	2.09740	0.73040
	White ash	0.08193	2.21408	0.97872
	Yellow poplar	0.00408	1.72233	1.93225
6	Black oak	0.04782	2.23369	1.00040
	Red oak	0.05629	2.29601	0.92143
	White oak	2.00678	2.47164	0.00113
	Hickory	0.29717	2.01833	0.74444
	White ash	0.10491	2.23978	0.80092
	Yellow poplar	0.00392	1.84763	1.72350
7	Black oak	0.04553	2.30400	0.94700
	Red oak	0.05584	2.36140	0.86098
	White oak	0.84076	2.35819	0.25532
	Hickory	0.22462	2.09270	0.73845
	White ash	0.04527	2.19763	0.99926
	Yellow poplar	0.00196	1.71852	1.94168
8	Black oak	0.00126	2.21421	1.00357
	Red oak	0.00153	2.28573	0.91464
	White oak	0.04080	2.39233	0.08289
	Hickory	0.00653	2.01978	0.74640
	White ash	0.00250	2.21651	0.84179
	Yellow poplar	0.00011	1.81799	1.78323
9	Black oak	0.00119	2.27814	0.95563
	Red oak	0.00152	2.34839	0.85527
	White oak	0.02036	2.35739	0.25671
	Hickory	0.00502	2.09134	0.73907
	White ash	0.00115	2.17690	1.02488
	Yellow poplar	0.00006	1.70452	1.97632
10	Black oak	0.03533	2.16790	0.90260
	Red oak	0.01113	2.30890	1.10200
	White oak	0.11137	2.22180	0.48180
	Hickory	0.17026	1.85320	0.80010
	White ash	0.07936	2.24202	0.50569
	Yellow poplar	0.03923	1.80992	1.18635
11	Black oak	0.01761	2.23760	0.99950
	Red oak	0.01787	2.29900	0.92350
	White oak	0.14902	2.48148	0.01744
	Hickory	0.09287	2.01840	0.73760
	White ash	0.00975	1.92041	1.45806
	Yellow poplar	0.00468	1.84840	1.73228
12	Black oak	0.01466	2.30940	0.94550
	Red oak	0.01547	2.36560	0.86250
	White oak	0.10634	2.39810	0.20060
	Hickory	0.06378	2.09740	0.73040
	White ash	0.01509	2.21408	0.97872
	Yellow poplar	0.00369	1.72233	1.93225
13	Black oak	0.00888	2.23369	1.00040
	Red oak	0.00898	2.29601	0.92143
	White oak	0.09102	2.47164	0.00113
	Hickory	0.04974	2.01833	0.74444
	White ash	0.01528	2.23978	0.80092
	Yellow poplar	0.00246	1.84763	1.72350
14	Black oak	0.00743	2.30400	0.94700
	Red oak	0.00780	2.36140	0.86098
	White oak	0.05733	2.35819	0.25532
	Hickory	0.03483	2.09270	0.73845
	White ash	0.00868	2.19763	0.99926
	Yellow poplar	0.00180	1.71852	1.94168
15	Black oak	.000015	2.21421	1.00357
	Red oak	.000015	2.28573	0.91464
	White oak	.000137	2.39233	0.08289
	Hickory	.000068	2.01978	0.74640
	White ash	.000024	2.21651	0.84179
	Yellow poplar	.000005	1.81799	1.78323
16	Black oak	.000013	2.27814	0.95563
	Red oak	.000013	2.34839	0.85527
	White oak	.000087	2.35739	0.25671
	Hickory	.000049	2.09134	0.73907
	White ash	.000015	2.17690	1.02488
	Yellow poplar	.000004	1.70452	1.97632

[1]Metrics of equation variables coincide with metrics of designated tables.

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1980. Weight and volume equations and tables for six upland hardwoods in southern Illinois. U.S. Department of Agriculture Forest Service, General Technical Report NC-60, 17 p. U.S. Department of Agriculture Forest Service, North Central Forest Experiment Station, St. Paul, Minnesota.

This paper presents tables of total tree green weight, green weight to a 5 cm and a 10 cm top diameter, dry weight to both 5 cm and 10 cm top diameter, and green volume to a 5 cm and a 10 cm top diameter for six upland hardwood species. Both metric and English unit tables are included.

KEY WORDS: Biomass, total tree utilization, yield tables.

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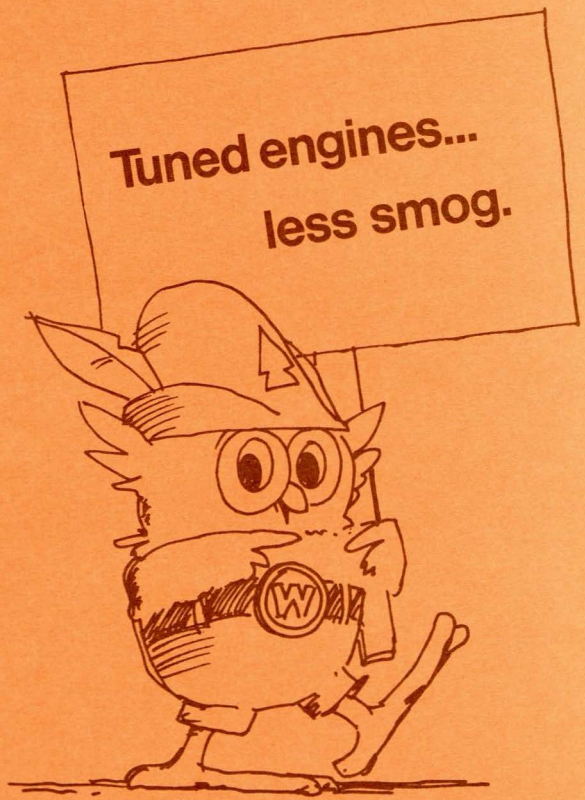
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less smog.